

# BIOL 7901: INTUITIVE STATISTICAL MODELING FOR LIFE SCIENCES

Department of Biology, College of Sciences  
1-2 credits, Fall 2025

## Course Instructor

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Office Hours: N/A for seminar

, in person by default, or via Zoom by appointment

## Course Description

This seminar is for life scientists who have taken statistics courses (or learned on the fly) but crave a deeper, more intuitive understanding of how models work, without the stress of exams or grades. This seminar is designed for life sciences graduate students who want to develop a deeper understanding of statistical modeling beyond routine applications. We will critically engage with McElreath's Statistical Rethinking, focusing on the conceptual foundations of Bayesian and multilevel modeling—how they work, why they behave the way they do, and where they succeed or fail in biological research.

The goal is not to train you in specific tools (though we will use R/Stan) but to build intuition for how models translate assumptions into inferences. This is particularly relevant for problems in ecology, genomics, epidemiology, and experimental biology, where conventional statistical approaches often fall short.

## Course Goals and Learning Objectives

Upon completion of the course, students will be able to:

- Understand the role of plant traits in the environment.
- Identify and judge adaptation versus acclimation.
- Consider the integration of plant traits among organs.
- Design research questions and experiments in plant physiology.
- Select appropriate methods to assess plant traits and responses.
- Confidently collect data to inspect variations in plant physiology.
- Interpret graphs and figures related to plant physiology.
- Communicate research findings in oral and written formats.

## Class Meetings

Time: Wednesday 3:00 - 4:50 pm (lecture)

Location: LSA 663

## Prerequisites

- 1) You have taken at least one prior statistics course (e.g., regression, hypothesis testing).
- 2) You are comfortable with basic R data manipulation (or willing to learn independently).

## Course Materials and Resources – Texts and Moodle

Moodle will be used to post course materials, including the syllabus, lecture slides, reading materials, and grades for all assignments.

This course will use the following text: “**Statistical Rethinking (2024 Edition)**” by Richard McElreath. The Text can be found at [https://github.com/rmcelreath/stat\\_rethinking\\_2024](https://github.com/rmcelreath/stat_rethinking_2024) along with most of the course materials

## Assessment and Grading Procedures

Grades will be assigned on the following scale without rounding:

A+: 98-100%   A: 84-97.9%   A-: 90-93.9%   B+: 87-89.9%   B: 84-86.9%   B-: 80-83.9%   C+: 77-79.9%   C: 71-76.9%   C-: 68-70.9%   D+: 65-67.9%   D: 62-64.9%   D-: 58-61.9%   F: <57.9%

The grade for this course will be based on the following components:

- (1) In Class Participation (50%): active contribution to discussing materials in class.
- (2) **One Class presentation (50%) Students will present a new method in their field and break it down for the class to understand the inner workings of the technique alongside its interpretation. The presentation is expected to be 15 minutes long, with 5 minutes for questions.**

## Course Policies and Specific Expectations

1. I expect that every class student has listened to the lecture materials and come ready to discuss. Along with discussing, everyone is expected to provide a supportive environment for fellow students to ask and answer questions.

## Course Schedule

*The course schedule is an approximation and subject to change at any time by the instructor. Lectures should be watched before attending class on the week specified. Lectures found at [https://github.com/rmcelreath/stat\\_rethinking\\_2024/tree/main](https://github.com/rmcelreath/stat_rethinking_2024/tree/main)*

Week	Meeting	Week	Description	Readings (2nd ed.)	Lectures
1	Lecture	8/25	Class Structure & introductions		
2	Lecture	9/3	Bayesian Inference	Ch. 1,2,3	1 & 2
3	Lecture	9/10	Linear Models & Causal Inference	Ch. 4	3 & 4
4	Lecture	9/17	Causes, Confounds, & Colliders	Ch. 5, 6	5 & 6
5	Lecture	9/24	Overfitting / Interactions	Ch. 7, 8, 9	7 & 8
6	Lecture	10/1	MCMC & Generalized Linear Models	Ch. 10, 11	9 & 10
7	Lecture	10/8	Integers & Other Monsters	Ch. 11, 12	11 & 12
8	Lecture	10/15	Multilevel Models 1	Ch. 13	13 & 14
9	Lecture	10/22	Multilevel Models 2	Ch. 14	15 & 16
10	Lecture	10/29	Measurements & Missingness	Ch. 15	17 & 18
11	Lecture	11/5	Generalized Linear Madness & Horoscopes	Ch. 16, 17	19 & 20
12	Lecture	11/12	Class Presentations 1		
13	Lecture	11/19	Class Presentations 2		
14	Lecture	11/26	NO CLASS *Thanksgiving Break*		
15	Lecture	12/3	Class presentations 3		

## **General University Policies**

### **Course Accessibility and Disability Statement**

Louisiana State University is committed to providing reasonable accommodations for all persons with disabilities. The syllabus is available in alternate formats upon request.

If you have a disability that may impact your work in this class and for which you may require accommodations, please see a **staff member in Disability Services** so that such accommodations can be considered. Students that receive accommodation letters, please meet with me to discuss the provisions of those accommodations as soon as possible.

### **LSU student code of conduct**

The LSU student code of conduct explains student rights, excused absences, and behavior expectations. Students are expected to understand this code as described here. Any violations of the LSU student code will be duly reported to the Dean of Students.

### **Expectations**

LSU's general policy states that for each credit hour, you (the student) should plan to spend at least two hours working on course-related activities outside of class. Since this course is for three credit hours, you should expect to spend a **minimum of six** hours outside of class each week working on assignments for this course. For more information see: <http://catalog.lsu.edu/content.php?catoid=12&navoid=822>.

### **Make-up Assignments for Authorized University Events or Co-curricular Activities**

Students who represent the university in an authorized event or activity (for example, student-athletes) and who cannot meet a course deadline due to a conflict with that event must provide the instructor with documentation in advance to arrange a make-up. No penalty will be applied. For more information, see the LSU policy at < [https://www.lsu.edu/policies/ps/ps\\_22.pdf](https://www.lsu.edu/policies/ps/ps_22.pdf) >

### **Make-up Assignments for Religious Observances**

Students must notify their instructor in advance if they intend to miss class for a religious observance. For more information, see the LSU policy at < [https://www.lsu.edu/policies/ps/ps\\_22.pdf](https://www.lsu.edu/policies/ps/ps_22.pdf) >.

### **In-Class Recording Statement**

Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use, for use in a complaint against the institution, or for use as evidence in a civil or criminal proceeding. Students may not record for any other purpose without the consent of the faculty member. A class lecture is defined as a formal or methodical oral presentation as part of a university course intended to present information or teach students about a particular subject. Recording classroom activities other than class lectures, including but not limited to lab sessions, student presentations (whether individually or part of a group), class discussion (except when incidental to and incorporated within a class lecture), clinical presentations such as patient history, academic exercises involving student participation, test or examination administrations, field trips, and private conversations is prohibited. Recordings may not be used as a substitute for class participation

and class attendance, and may not be published or shared without the written consent of the faculty member. Failure to adhere to these requirements may violate the University's Student Code of Conduct.

### **Academic Integrity**

Students should familiarize themselves with LSU's Code of Student Conduct at <https://www.lsu.edu/saa/students/codeofconduct.php> According to Section 1, "Academic Misconduct," students are prohibited from engaging in

1. Unauthorized assistance: Using or attempting to use unauthorized materials, information, or study aids in any academic exercise unless authorized by the instructor of record. The unauthorized possession of examination or course-related material also constitutes cheating.
2. Communication to another through written, visual, electronic, or oral means: The presentation of material which has not been studied or learned, but instead was obtained through someone else's efforts and used as part of an examination, course assignment, or project.
3. Commercial Use of Academic Material: Selling course material to another person, student, and/or uploading course material to a third-party vendor without authorization or the university's and the instructor's express written permission. Course materials include but are not limited to class notes, Instructor's PowerPoints, course syllabi, tests, quizzes, labs, instruction sheets, homework, study guides, handouts, etc.
4. Falsifying or misrepresenting the student's own academic work.
5. Plagiarism: Using or appropriating another's work without any indication of the source, thereby attempting to convey the impression that such work is the student's own.
6. Multiple Submissions: Submitting the same academic work for credit more than once without the express written permission of the instructor.
7. Helping another violates academic behavior standards.
8. Soliciting assistance with academic coursework and/or degree requirements.

### *Responses to Academic Dishonesty, Plagiarism, or Cheating*

Students should also familiarize themselves with the procedures for academic misconduct in LSU's student handbook. LSU faculty members are responsible for students' education and the value of an LSU degree, so they seek to prevent unethical behavior and respond to academic misconduct when necessary. Penalties for violating rules, policies, and instructions within this course can range from a zero on the exercise to an "F" letter grade in the course. In addition, an Academic Misconduct report could be filed with the Office of Student Conduct, which could lead to a disciplinary warning, disciplinary probation, or deferred suspension or separation from the University through suspension, dismissal, or expulsion with the addition of a "Z" designation on one's transcript.

Being found in violation of academic conduct standards could result in a student having to disclose such behavior on a graduate school application, being removed from a leadership position within a student organization, being the recipient of scholarships, and participating in University activities such as study abroad, internships, etc.

Let's avoid all of this by demonstrating values of honesty, trust, and integrity. No grade is worth compromising your integrity and moving your moral compass. Stay true to doing the right thing: take the zero, not a shortcut.

### **Academic Success**

The primary ingredients of your academic success are attending class, managing time efficiently, taking good notes, and developing good critical thinking and communication abilities. LSU has several excellent resources that will assist you in developing these skills. The place to begin is the Center for Academic Success. The CAS offers guidance on what learning strategies best suit your talents, tutoring in the basic subjects, and workshops on various topics, from note-taking to time management. Communication Across the Curriculum assist students in developing the communication skills necessary for academic and professional success. Finally, concerning professional success, the LSU Olinde Career Center can assist you in choosing a major and a profession that best suits your talents and passions and help you develop a four-year career plan to ensure success when you graduate from LSU.

### **Diversity, Equity & Inclusion Statement**

We believe diversity, equity, and inclusion enrich the educational experience of our students, faculty, and staff and are necessary to prepare all people to thrive personally and professionally in a global society. Therefore, LSU is firmly committed to an environment that affords respect to all members of our community. We will work to eliminate barriers that any members of our community experience.

To make LSU a place where that can happen, we must recognize and reflect on the inglorious aspects of our history. We now acknowledge the need to confront how racism, sexism, ableism, ageism, classism, LGBTQ+ phobia, intolerance based on religion or national origin, and all forms of bias and exploitation have shaped our everyday lives.

We accept personal and professional responsibility to eliminate bias and oppression wherever they are found. We understand our obligation to speak up when we see bias in our teaching, study, or daily work. Our community will educate themselves proactively and continuously about how to intervene and bring bias to the attention of others with commitment and compassion.

We will hold ourselves accountable for our actions and inactions and for maintaining intentional, measurable, and meaningful efforts to enhance diversity, equity, and inclusion, including through ongoing evaluation of our policies, practices, and procedures.

### **Nondiscrimination, Sexual Harassment, & Title IX**

LSU provides equal opportunity for all qualified persons in admission to, participation in, or employment in the programs and activities which the university operates without regard to race, creed, color, marital status, sexual orientation, gender identity, gender expression, religion, sex, national origin, age, mental or physical disability, or veteran's status. LSU has implemented a procedure to address complaints for those who believe they have been subjected to discrimination and/or harassment violating this policy. Please know that your instructors are here to support and listen to your experience. We also want you to know that we are mandatory reporters and must report what we know to the Office of Civil Rights and Title IX. All LSU

employees, with few exceptions, are required to report instances of sex- or gender-based harassment and discrimination, including sexual misconduct and power-based violence (e.g., sexual assault, stalking, dating violence, domestic violence, sexual exploitation, retaliation, etc.) for which they may not be the victim, but of which they are aware. The Office of Civil Rights & Title IX is the LSU office investigating complaints regarding discrimination, sexual harassment, or power-based violence. The Office of Civil Rights & Title IX is at 118 Himes Hall, and the phone number is (225) 578-9000. Suppose you know of an individual who has been victimized. In that case, you are encouraged to contact the Office of Civil Rights & Title IX or file an online report by visiting **LSU's Domestic & Sexual Violence Support and Reporting** website and clicking the **Report an Incident** box. If you have been assaulted, harassed, or a victim of violence, we encourage you to contact the Office of Civil Rights & Title IX. Please reach out for help immediately.

Some excellent resources available to Baton Rouge residents include:

- STAR (Sexual Trauma Awareness and Response; 24/7 hotline: (855) 435-STAR (7827)
- IRIS Domestic Violence Center; 24/7 hotline: (800) 541-9706
- The Lighthouse Program; (225) 578-5718 VIA LINK; (800) 273-TALK (8255) [national line but answered from New Orleans]

National resources include:

- RAINN (Rape, Abuse & Incest National Network); 24/7 hotline: (800) 656-4673
- National Sexual Violence Resource Center

For additional information, visit [www.lsu.edu/civil-rights](http://www.lsu.edu/civil-rights), the **Office of Civil Rights & Title IX**, and review **PM-73** (Prohibiting Power-based Violence, including Sex- and Gender-based Harassment and Discrimination, and Sexual Misconduct).